



# Research Brief #23

2002

## Comparative Validation of Innovative Capping Technologies: "Active Capping"

### Introduction

The Hazardous Substance Research Center/South and Southwest (HSRC/S&SW) has begun a federally funded research demonstration on the Anacostia River in Washington, DC, to evaluate the potential of "active capping" technologies for contaminated sediment management.

The Anacostia is one of the nation's 10 most endangered rivers, flowing from Maryland to the District of Columbia, where it empties into the Potomac River. Sediments in the Anacostia include potentially high hazardous levels of polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), metals, and other contamination caused by industrial, municipal, and military activities on the river.

Like conventional *in-situ* caps, active caps isolate contaminated sediments, but

they also allow treatment of pollutants without sediment removal. The goal of the Anacostia demonstration is to comparatively validate, on a field scale, the performance of traditional and alternative active capping technologies under realistic, well-documented conditions. Researchers hope that the project will lead to:

- better technical understanding of controlling parameters;
- greater ability to provide technical guidance for remedy selection;
- broader scientific, regulatory, and public acceptance of innovative capping approaches.

### Project Participants

Louisiana State University (LSU), the lead institution in the HSRC/SSW coalition, is coordinating the Anacostia demonstration in cooperation with the Anacostia Watershed Toxics Alliance, which includes a group of federal, state, and district environmental agencies as well as companies and conservation groups with interest in Anacostia water quality.

Horne Engineering of Fairfax, VA, is the project's prime contractor, and several technology developers will participate in the project. Researchers at Carnegie Mellon University, LSU, Rice University, and the University of New Hampshire will evaluate several of the technologies. The center will also benefit from a third-party evaluation by the EPA Superfund Innovative

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### Summary of the Problem

The U.S. has significantly reduced contaminants in the nation's waterways, but some of the pollutants deposited prior to the last few decades remain locked in contaminants. The contaminated sediments burden falls heavily on the South and Southwest regions, which have 54 percent of the nation's wetlands and 45 percent of its inland waters. Because of the problem's regional importance, sediment remediation has been the central research theme of the Hazardous Substance Research Center/South & Southwest (HSRC) program.

Removal and treatment of contaminated sediments is often prohibitively expensive, but in the 1990s HSRC/SSW-sponsored research established that *in-situ* methods of contaminated sediment management are technically feasible and cost effective.

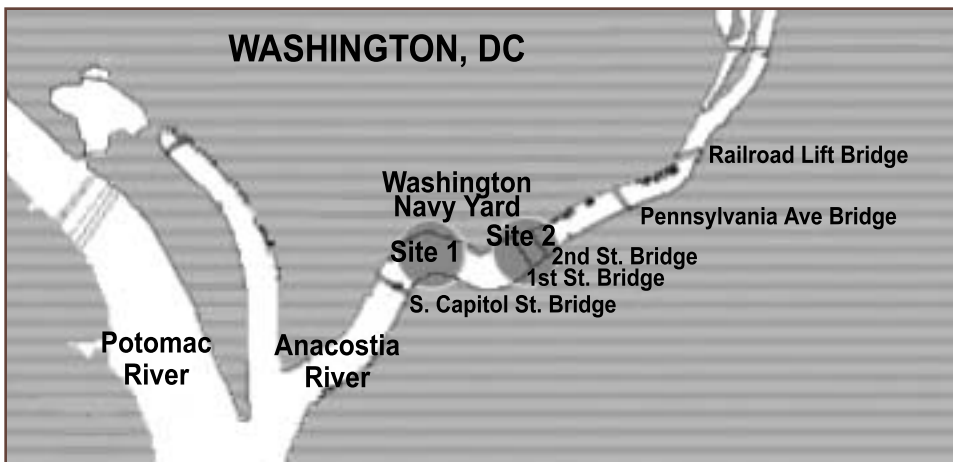
One of these *in-situ* methods is capping, which involves the placement of a covering or cap over an established layer of contaminated sediment. This covering seals the sediments physically and chemically, preventing pollutants from migrating into the surrounding water. The cap is composed of one or more layers of sand, silt, rock, or geotextile fabric.

The main limitation of *in-situ* capping is that contaminants remain untreated and may be released if the sediment cap is penetrated by activities such as recreational boating, dredging, harbor development, or burrowing by aquatic worms.

One of the alternatives proposed for overcoming this limitation is "active" capping, which allows treatment of contaminants to proceed during sediment sequestration. The first major demonstration of alternative active cap designs is now underway on the Anacostia River in Washington, DC.



*A box corer sample of Anacostia River sediments is prepared for laboratory treatability testing in a demonstration of active capping technologies.*



Site map for the active capping demonstration near the Anacostia River's junction with the Potomac River in the District of Columbia.

Technology Evaluation (SITE) Program and technical support from the U.S. Army Corps of Engineers and the U.S. Navy Space and Naval Warfare System Center (SPAWAR).

## Project Design

The project team will establish a grid of capping cells at two sites on the Anacostia near the Washington Navy Yard. Researchers will then:

- assess contaminant behavior before cap placement;
- deploy various types of caps within the grid and evaluate placement approaches and implementation effectiveness;
- monitor caps for chemical isolation, fate processes, and physical stability;
- compare the effectiveness of different cap types and controls in achieving performance goals.

## Innovative Capping Designs

Alternative capping technologies that are under consideration include:

- *AquaBlok™* for control of seepage and advective contaminant transport;
- *Zero-valent iron* to encourage dechlorination and metal reduction;
- *Apatite phosphate mineral barriers* to encourage sorption and reaction of metals;
- *BionSoil™* to encourage degradation of organic contaminants;

- *Natural organic sorbents* to encourage sorption-related retardation (reduction in advective-diffusive transport);
- *Other potential cap materials* including Ambersorb, a commercial sorbent, and coal-based sorbents.

## Other Progress to Date

The project team has begun treatability testing to ensure that the alternative capping technologies are applicable to the conditions and needs of the Anacostia River. In fall 2002, researchers expect to conclude these tests and report preliminary conclusions. Other 2002 work includes development of a site characterization work plan and initiation of site characterization.

## Future Plans

The timeline for future work includes the following activities:

- *First quarter 2003*: Completion of preliminary laboratory treatability studies and initiation of preliminary field construction design work.
- *Second quarter 2003*: Field construction design, field construction, and evaluation of placement effectiveness.
- *Third quarter 2003*: Cap effectiveness evaluation and preparation of report on cap placement effectiveness.
- *Third quarter 2005*: Project completion.



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